

The following table gives the resulting longitude of Shanghai East of Greenwich, as determined from these observations :—

Wladiwostok, East of Greenwich, by cable	$\begin{array}{r} \text{h} \quad \text{m} \quad \text{s} \\ -8 \quad 47 \quad 30.91 \end{array}$
Nagasaki, West of Wladiwostok, by cable	$\begin{array}{r} + \quad 8 \quad 1.92 \end{array}$
Nagasaki (telegraph office) East of Greenwich	$\begin{array}{r} -8 \quad 39 \quad 28.99 \end{array}$
Shanghai (Observatory), West of Nagasaki	$\begin{array}{r} + \quad 33 \quad 36.00 \end{array}$
Shanghai (Observatory), East of Greenwich	$\begin{array}{r} -8 \quad 5 \quad 52.99 \end{array}$

The latitude of the Observatory as determined by transits of stars on the prime vertical is

$$\text{N. } 31^{\circ} 14' 10'' 23.$$

Ephemeris for finding the Positions of the Satellites of Uranus,
1881. By A. Marth, Esq.

About the beginning of October 1881 the Earth will pass through the planes of the orbits of the satellites of *Uranus*, from the side on which the satellites appear to move in the direction of decreasing position-angles to the other side; it will repass the planes about the end of March 1882, and will, about the middle of July 1882, finally pass to the side on which the satellites appear to move in the direction of increasing position-angles, and on which it will remain till the year 1923. The apparitions of the planet in 1881, 1882, and 1883 will consequently be most favourable for the determination of the planes of the satellites' orbits. The most important measurements for the purpose are those of the position-angles when the satellites are near their greatest elongations, and when they are very near the planet; and to secure these observations it may be advisable, in case there is not ample opportunity for observing, to dispense with getting exact measurements of the distances, and to devote the available time to obtaining greater accuracy in the position-angles. It has not yet become known how near to the planet the satellites may be observed with some modern instruments.

The angle of position p_0 of the major axes, the major and minor semi-axes a and b of the apparent ellipses described by the satellites, and the latitude of the Earth above the assumed plane of their orbits, are the following :—

Greenwich Noon, 1881.	ρ_0	Ariel.		Umbriel.		Titania.		Oberon.		Lat. of Earth.
		a	b	a	b	a	b	a	b	
Jan.	9	14.95	0.57	20.82	0.80	34.15	1.31	45.67	1.75	-2.20
	19	15.06	0.64	20.98	0.89	34.41	1.46	46.01	1.95	2.43
	29	15.15	0.72	21.11	1.01	34.62	1.66	46.30	2.21	2.74
Feb.	8	15.22	0.82	21.21	1.15	34.79	1.89	46.52	2.52	3.11
	18	15.27	0.93	21.27	1.30	34.89	2.14	46.66	2.86	3.51
	28	15.29	1.05	21.30	1.46	34.94	2.40	46.72	3.21	3.94
March	10	15.28	1.16	21.29	1.62	34.92	2.66	46.70	3.56	4.37
	20	15.25	1.27	21.25	1.77	34.85	2.91	46.60	3.89	4.79
	30	15.19	1.37	21.16	1.91	34.71	3.13	46.42	4.18	5.17
April	9	15.11	1.45	21.05	1.02	34.53	3.31	46.17	4.43	5.50
	19	15.01	1.51	20.91	2.10	34.30	3.45	45.87	4.62	5.77
	29	14.90	1.55	20.75	2.16	34.04	3.54	45.52	4.73	5.97
May	9	14.77	1.56	20.58	2.18	33.75	3.58	45.14	4.78	6.08
	19	14.64	1.56	20.40	2.17	33.45	3.56	44.74	4.76	6.10
	29	14.51	1.53	20.21	2.13	33.15	3.49	44.33	4.67	6.04

Longitudes of the satellites in their orbits reckoned from the points where they are at their greatest northern elongations:—

Greenwich Noon.	Ariel.		Umbriel.		Titania.		Oberon.	
	Long.	Diff.	Long.	Diff.	Long.	Diff.	Long.	Diff.
1881. Jan.	9							
	228°23	0	218°61	868°71	15°11	0	9°39	0
	19	1428°43	7°32		68°61	413°50	276°76	267°37
Feb.	29	°39	156°02	°70	122°10	°49	184°12	°36
	8	°37	304°69	°67	175°58	°48		°36
	18	°34	93°35	°66	229°05	°47	91°48	°34
	28	°31	241°99	°64	282°50	°45	358°82	°34
March	10	°29	30°61	°62	335°95	°45	266°16	°33
	20	°27	179°22	°61	29°40	°45	173°49	°33
	30	°25	327°82	°60	82°85	°45	80°82	°33
	April 9	°23	116°42	°60	136°30	°45	348°15	°34
April	19	°23	265°02	°60	189°75	°45	255°49	°35
	29	°22	53°62	°60	243°21	°46	162°84	°35
	9	°22	202°23	°61	296°68	°47	70°19	°36
	May 9	°23	350°84	°61			337°55	°37
May	19	°24	139°46	°62	360°16	°48	244°92	°39
	29				43°64		152°31	

These values are to be interpolated for the times for which the positions of the satellites are required. The position-angles p and distances s are then found by means of the formulæ—

$$s \cos (p_0 - p) = a \cos \text{long.}$$

$$s \sin (p_0 - p) = b \sin \text{long.}$$

The satellites move in the direction of decreasing position-angles, and will be at their greatest elongations (“N” in posit. p_0 and “S” in posit. $p_0 + 180^\circ$) and at their superior and inferior conjunctions with the planet (“sup.” in posit. $p_0 + 90$ and “inf.” in posit. $p_0 + 270^\circ$) at the following hours, Greenwich mean time:—

Ariel.

1881	d	N. h	d	S. h		d	N. h	d	S. h
Jan.	9	12.1	10	18.3	March	23	14.3	24	20.5
	12	0.5	13	6.8		26	2.8	27	9.0
	14	13.0	15	19.3		28	15.3	29	21.5
	17	1.5	18	7.8		31	3.7		
	19	14.0	20	20.2	April			1	10.0
	22	2.5	23	8.7		2	16.2	3	22.5
	24	15.0	25	21.2		5	4.7	6	11.0
	27	3.5	28	9.7		7	17.2	8	23.5
	29	16.0	30	22.2		10	5.7	11	12.0
Feb.	1	4.4	2	10.7		12	18.2	14	0.5
	3	16.9	4	23.2		15	6.7	16	13.0
	6	5.4	7	11.7		17	19.2	19	1.5
	8	17.9	10	0.2		20	7.7	21	14.0
	11	6.4	12	12.6		22	20.2	24	2.4
	13	18.9	15	1.1		25	8.7	26	14.9
	16	7.4	17	13.6		27	21.2	29	3.4
	18	19.9	20	2.1		30	9.7		
	21	8.4	22	14.6	May			1	15.9
	23	20.9	25	3.1		2	22.2	4	4.4
	26	9.3	27	15.6		5	10.7	6	16.9
	28	21.8				7	23.2	9	5.4
March			2	4.1		10	11.7	11	17.9
	3	10.3	4	16.6		13	0.2	14	6.4
	5	22.8	7	5.1		15	12.6	16	18.9
	8	11.3	9	17.6		18	1.1	19	7.4
	10	23.8	12	6.0		20	13.6	21	19.9
	13	12.3	14	18.5		23	2.1	24	8.4
	16	0.8	17	7.0		25	14.6	26	20.9
	18	13.3	19	19.5		28	3.1	29	9.4
	21	1.8	22	8.0					

Dec. 1880. *the Positions of the Satellites of Uranus.*

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Umbriel.

1881	N.		S.			N.		S.	
	d	h	d	h		d	h	d	h
Jan.	6	11.7	8	13.3	March	22	1.9	24	3.7
	10	15.1	12	16.8		26	5.4	28	7.2
	14	18.5	16	20.2		30	8.9		
	18	22.0	20	23.7	April			1	10.6
	23	1.4	25	3.2		3	12.4	5	14.1
	27	4.9	29	6.6		7	15.8	9	17.6
	31	8.4				11	19.3	13	21.0
Feb.			2	10.1		15	22.8	18	0.5
	4	11.8	6	13.5		20	2.2	22	4.0
	8	15.3	10	17.0		24	5.7	26	7.4
	12	18.7	14	20.5		28	9.2	30	10.9
	16	22.2	18	23.9	May	2	12.7	4	14.4
	21	1.7	23	3.4		6	16.1	8	17.9
	25	5.1	27	6.9		10	19.6	12	21.3
March	1	8.6	3	10.3		14	23.1	17	0.8
	5	12.1	7	13.8		19	2.5	21	4.3
	9	15.5	11	17.3		23	6.0	25	7.7
	13	19.0	15	20.7		27	9.5	29	11.2
	17	22.5	20	0.2					

Titania.

N. elong.			Inf. conj.			S. elong.			Sup. conj.		
h			h			h			h		
Jan.	8	15.2	Jan.	10	19.5	Jan.	12	23.7	Jan.	15	3.9
	17	8.2		19	12.4		21	16.6		23	20.9
	26	1.1		28	5.4		30	9.6	Feb.	1	13.8
Feb.	3	18.1	Feb.	5	22.3	Feb.	8	2.6		10	6.8
	12	11.0		14	15.3		16	19.5		18	23.8
	21	4.0		23	8.3		25	12.5		27	16.7
March	1	21.0	March	4	1.2	March	6	5.5	March	8	9.7
	10	14.0		12	18.2		14	22.4		17	2.7
	19	6.9		21	11.2		23	15.4		25	19.7
	27	23.9		30	4.2	April	1	8.4	April	3	2.6
April	5	16.9	April	7	21.1		10	1.4		12	5.6
	14	9.9		16	14.1		18	18.3		20	22.6
	23	2.8		25	7.1		27	11.3		29	15.5
May	1	19.8	May	4	0.0	May	6	4.3	May	8	8.5
	10	12.8		12	17.0		14	21.2		17	1.5
	19	5.7		21	10.0		23	14.2		25	18.4
	27	22.7		30	2.9						